Converting Agricultural Lesson Plans to be Common Core Compliant for Grades 3-5

Brittany Withnell
California Polytechnic State University, San Luis Obispo
1 Grand Avenue
San Luis Obispo, CA 93407
bwithnel@calpoly.edu

Hattie Jameson
California Polytechnic State University, San Luis Obispo
1 Grand Avenue
San Luis Obispo, CA 93407
hkjameso@calpoly.edu

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Introduction

There are few Common Core approved lesson plans for teachers to incorporate into traditional science programs in California. The Farm Bureau's Ag in the Classroom (AITC) program provides K-12 educators lesson plans with an agricultural focus. Only 13 out of 45 of the lesson plans that the California AITC website offers are Common Core approved (Learn About Ag, 2017).

Agricultural literacy is valuable to consumers, can lead to careers in agriculture, and can create a greater understanding of the world and of science for students. The agricultural lessons give students a real life relationship with what they are learning and encourage a higher rate of agricultural literacy in society.The focus of this project is to create Common Core compliant lesson plans covering different components of agriculture with the intent of encouraging agricultural education in elementary school classrooms with the goal of increasing agricultural literacy in youth.

Background

Agriculture education and literacy is important because it allows "students to be connected to the lives and livelihoods that are a large part of their schools, communities, and/or state... [it] connect[s] students to the bigger world... [it] teach[es] them to be stewards of the environment... [it] [teaches] students a sense of connectedness to life" (Knobloch et al., 2007).

Despite its importance, agricultural literacy is lacking in today's society. "Food consumers face uncertainty and demand high quality and safe food products" (Wim Verbeke, 2005), but according to a video survey created by America's Farmers in 2012, the common, urban consumer seems to have little knowledge about the industry.

The mission of Agriculture in the Classroom is to "increase agricultural literacy through K-12 education." Agricultural literacy is to "understand the food and fiber system...includ[ing] its history and its current economic, social and environmental significance to all Americans" as defined by the Committee on Agricultural Education in Secondary Schools (1988). AITC's programs "seek to improve student achievement by applying authentic, agricultural-based content as the context to teach core curriculum concepts in science, social studies, language arts and nutrition. By encouraging teachers to embed agriculture into their classroom, AITC cultivates an understanding and appreciation of the food and fiber system that we all rely on every day. AITC is unique within the agricultural education community as the lead organization to serve the full spectrum of K-12 formal education" (AITC, 2017).

Methodology

The California Common Core standards was the main research of this project. They were found using the California Department of Education's Resources Page and chosen based on how well they could translate to an agricultural lesson. Lessons were identified and chosen based on their relation to agricultural education, their ability to agree with the standards, and whether they were appropriate to the specific grade levels. After researching Common Core compliant lessons, a lesson plan template was chosen as a guide. The lesson plans were rewritten into this template and then Ag in the Classroom was contacted and asked to provide guidance or resources. The contact ensured that the lesson plans that developed met the standards as intended.

Results

Lesson 1: Plants Grown in Different Environments

Common Core Aligned Lesson Plan Template

Subject(s): _Science _____ Grade: __3rd_____

Teacher(s): _____ School: _____

LESSON ELEMENT	STUDENT-FRIENDLY TRANSLATION (# 2,3,4 only)
1. Common Core Learning Standard(s) Addressed: CDE Standards Addressed: 3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted, and a pet dog that is given too much food and little exercise may become overweight.]	
2. Learning Target(s): (What will students know & be able to do as a result of this lesson?) Students will be able to understand how the difference in sun, soil, and water affect the growth of a plant. They will understand how the environment affects the plants.	Today we will be learning about how the environment a plant is in affects how it grows.
3. Relevance/Rationale: (Why are the outcomes of this lesson important in the real world? Why are these outcomes essential for future learning?) What do seeds need to grow? 1.Lead a discussion by starting with 'what do children need to grow?' Then, ask the students what they think plants might need. 2.Sprout a seed in a plastic bag with wet paper towels. A bean seed works great for this. You can also try alfalfa sprouts, or popcorn. Put some seeds in a clear plastic cup with soil. 3.Put some of the seeds in a windowsill to sprout. Put others in a dark corner. Discuss with the children, which of the seeds they think will grow the best. Check and show the children periodically. 4.Have the children estimate how long it will take the seeds to germinate. Chart the growth of the seedlings after they sprout 5.Have the children observe and write on their worksheet what they have observed. 6. Have the students answer review question and infer what plants need to grow.	We will be planting seeds in different locations around the room. We will be observing throughout the week how the plants in the different locations grow differently.
4. Formative Assessment Criteria for Success: (How will you & your students know if they have successfully met the outcomes? What specific criteria will be met in a successful product/ process? What does success on this lesson's outcomes look like?) Plants on the plastic bag in the sun will have a sprout. Plants in the cup in the sun who have been watered should also have sprouted. Plants in the cup in the dark should not have sprouted. And plants in the cup, in the sun that have not been watered should not have a sprout.	We can see that pants in all the locations look different. Let us discuss what plants grew well and what plants did not.

Plant Observation

In the Bag	In the Cup with sun and water.	In the Cup with sun and no water	In the Cup in the dark closet.

In the Bag	In the Cup with sun and water.	In the Cup with sun and no water	In the Cup in the dark closet.

Review Questions:

What plants that you observe sprouted?

Why do you think the others did not sprout?

What plant looked the best?

Based on these observations what does a plant need to grow?

Lesson 2: Growing plants with Hydroponics

Common Core Aligned Lesson Plan Template

Subject(s): ____Growing Plants with Hydroponics_____ Grade: ____5th_____

Teacher(s): _____ School: _____

LESSON ELEMENT	STUDENT-FRIENDLY TRANSLATION (# 2,3,4 only)
1. Common Core Learning Standard(s) Addressed: ➢ 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from soil.]	
2. Learning Target(s): (What will students know & be able to do as a result of this lesson?) ➢ Students will be able to define hydroponics and be able to explain how it works. ➢ Students will be able to list advantages and disadvantages of using a hydroponic system in agriculture. ➢ Students will be able to compare and contrast hydroponically and soil grown plants.	➢ Define and explain what hydroponics is and how it works. ➢ List pros and cons of hydroponics. ➢ Find differences and similarities with hydroponic and soil grown plants.
3. Relevance/Rationale: (Why are the outcomes of this lesson important in the real world? Why are these outcomes essential for future learning?) ➢ This lesson teaches students that plant matter comes mostly from air and water, not soil. It is important because hydroponics is growing in the agriculture industry. It also shows students the benefits of using hydroponics as well as the opportunity to experience plant growth firsthand.	➢ Students see plants being grown without soil. ➢ Gives students a basic understanding of hydroponics and its role in agriculture.
4. Formative Assessment Criteria for Success: (How will you & your students know if they have successfully met the outcomes? What specific criteria will be met in a successful product/process? What does success on this lesson's outcomes look like?) ➢ Students will complete a worksheet that records their observations of the experiment and has them reflect on the results. ➢ The teacher will lead a class discussion to ensure that the students understood the point of the experiment.	➢ Student records observations and answer reflection questions. ➢ Class discussion on observations and results.
5. Activities/Tasks: (What learning experiences will students engage in? How will you use these learning experiences or their student products as formative assessment opportunities?) ➢ Direct Instruction: 1. Ask students what plants need to survive and, after identifying, introduce 'hydroponics' and then have students define it and 'nutrients' in a class discussion. 2. The teacher will read the hydroponics fact sheet with the students and ask questions to check for understanding throughout. ➢ Hydroponics Lab: 3. Plant one of their lettuce plants in a soil container. 4. Students water the plant, measure, sketch it on their worksheet, and continue to monitor its size for two weeks. 5. Next, students shake the soil from the second lettuce plant's roots, have them carefully slide the root section through the straw section of the cup lid. Make the opening bigger if necessary. Once the roots are hanging down, have students fill the cup with water until the level is high enough to reach the roots when the lid is placed on the cup and mix hydroponics solution into the water, then secure the lid on the cup. 6. Students will measure and sketch on worksheet, and continue to monitor its size for two weeks. 7. Place both plants in a window and allow students to predict which plant will grow the most, be the most healthy, and taste the best. 8. Check on daily and record data. After two weeks, draw conclusions. ➢ Students will answer reflection questions on worksheet, then the teacher will lead a class discussion.	
6. Resources/Materials: (What texts, digital resources, & materials will be used in this lesson?) ➢ Copies of the Hydroponics Fact Sheet ➢ Hydroponics Lab Worksheet ➢ Clear plastic cups with lids that attach and contain a hole for the straw, such as those from a restaurant (two for each group) ➢ Small lettuce plants (two for each group) ➢ Soil ➢ Water ➢ Hydroponics nutrients, which can be purchased online or from plant stores	
7. Access for All: (How will you ensure that all students have access to and are able to engage appropriately in this lesson? Consider all aspects of student diversity.) ➢ The teacher will provide all materials necessary for the lesson and will demonstrate how to properly do everything. ➢ Students will be in groups to encourage the students to collaborate and discuss ideas and issues.	
8. Modifications/Accommodations: (What curriculum modifications and/or classroom accommodations will you make for Students with Disabilities in your class? Be as specific as possible.) ➢ The teacher will demonstrate, explain information, and ask questions in more than one way. ➢ The teacher will read aloud anything written or visual. ➢ Keep instructions brief and uncomplicated and allow time for clarification.	

Hydroponics Fact Sheet

What is Hydroponics?

Hydroponics is a method for growing plants without using soil. The **nutrients** that plants need to grow are put into water and then delivered to the roots of the plants. In hydroponics, the water does the work of delivering the nutrients to the plants.

How Can Plants Grow Without Soil?

- Plants need water, sunlight, carbon dioxide, and mineral nutrients to grow.
  - They get water when it rains or you water them.
  - Sunlight is provided from the sky or from special types of artificial lights.
  - Carbon dioxide is in the air we breathe.
  - Mineral nutrients needed by plants are often naturally present in the soil, but they are also in fertilizers.
- The soil itself is not really needed by the plants - just the nutrients in it. So if the nutrients are put in water, the plants can get what they need to grow without the soil.

Strawberries and lettuce can be grown using hydroponics!

Hydroponics is a method of growing plants without soil by getting the **nutrients** they need to them through **water**. Hydroponic farmers have devised many methods for doing this. Hydroponics makes it possible for food to be grown in areas with little soil and rainfall; this method of growing can also produce more crops and grow them more quickly, and has less impact on the environment than traditional farming in soil.

Hydroponics Lab

Day 1 Sketches

Plant in Soil	Hydroponic Plant

Plant in Soil Measurements (in centimeters)

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Day 8	**Day 9**	**Day 10**	**Day 11**	**Day 12**	**Day 13**	**Day 14**

Hydroponic Plant Measurements (in centimeters)

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Day 8	**Day 9**	**Day 10**	**Day 11**	**Day 12**	**Day 13**	**Day 14**

Predictions

1. Which plant will grow the most?
2. Which plant will be the most healthy?
3. Which plant will taste best?

Results

1. Which plant grew the most?
2. Which plant is the most healthy?
3. Which plant tastes best?
4. What is the difference between how the hydroponic plant grew and how the plant in soil grew?
5. Does a plant need soil to grow?

Conclusion & Recommendations

There are many resources that can aid in converting lessons to be Common Core compliant. Ag in the Classroom provides examples to refer to and people to contact for questions. The Common Core Team for the California Department of Education can answer questions and provide guidance. There is no specific way Common Core compliant lessons must be planned as long as objectives meet the Common Core State Standards and the lesson meets the objectives. Based on the results, it is recommended that when changing a lesson to be compliant or creating new lesson, they should be in units like the examples found on Ag in the classroom. The template used was successful, but still needed to be altered to match the style on AITC's website. There is still a need for more Common Core compliant and it is suggested that lessons and units be sent to AITC to be reviewed and published on agclassroom.org and/or learnaboutag.org.

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